# (Check) Design Thinking for Computational Creativity – a Case Study of International Exchanges Using Game and Animation (2014-Recent)

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# Design Thinking for Computational Creativity – a Case Study of International Exchanges Using Game and Animation (2014-Recent)


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**Abstract—The Asia-Pacific region has been dominating the global video game market for years. In recent years, an increasing number of Indonesia students are turning their interest to study in Taiwan. However, Chinese education in Indonesia is fundamentally based on studies of Mainland China, therefore lacking opportunities for students to understand profoundly Taiwan's language and culture. Furthermore, there is a lack of opportunities for students to understand game design power and industry in Taiwan. The purpose of this on-going program (2014-recent) is to enhance the understanding of game and animation design education in Taiwan, through exchanges with students in Indonesia. It aims to promote exchanges between the faculty and students at the universities with faculties, lecturers and artists in Taiwan for collaborative work, especially in game art design, game engine and animation. It sincerely hopes that students could understand profoundly Taiwan's language and culture by game and animation online tutorials, and provide opportunities for students to understand game design power and industry in Taiwan, Indonesia, and worldwide market. After a year of implementing the four points mentioned in this article, we have already observed some evident outcome. The biggest achievement comes from the workshop which has received significant responses and an increasing number of attendances from both Taiwan and Indonesia. In the near future, it hopes that we can hold a public event such as lecture, workshop and exhibition to raise awareness of and develop an affinity with Taiwanese langue and culture among the general public using the design thinking approach for computational creativity, such as co-design Taiwan language on-line course or game-based learning.**



***Keywords—Design Thinking, Computational Creativity, International Exchanges, Game and Animation***


## I. Introduction

### *A. Asia-Pacific Region Dominating the Global Video Game Market*

The Asia-Pacific region has been dominating the global video game market for years. In 2018, it was calculated that revenue from the games market in that region alone amounted to 71.4 billion U.S. dollars, more than twice the revenue of the second-ranked North American gaming market. Within Asia, the leading country markets are China, Japan, and South Korea. In 2018, the Chinese video game industry revenue reached 214.44 billion yuan (approximately 31.42 billion U.S. dollars), which represented a staggering growth of 195.9 billion yuan (about 28.71 billion U.S. dollars) since 2008. Japan, which is home to gaming giants such as Nintendo and Namco Bandai, is, in fact, the second-largest gaming market in the Asia Pacific. As of January 2019 the country's gaming revenue amounted to 17.715 billion U.S. dollars. South Korea has also confirmed its place amongst the leaders in the Asian region, with its game industry revenue valued at nearly 5.8 billion U.S. dollar as of 2019 [1].

The graph shows the estimated games market revenue worldwide from 2015 to 2019, broken down by region. According to the calculations, Asia Pacific remains the largest gaming market based on revenues, which are projected to reach 72.2 billion U.S. dollars in 2019 [1].


Fig. 1. Estimated games market revenue worldwide from 2015 to 2019 [1]

### B. Taiwan-Indonesia Relations

In 1971, Taiwan and Indonesia agreed to mutually establish a representative office in Taipei and Jakarta. In 1989 the "Chinese Chamber of Commerce to Jakarta" renamed to "Taipei Economic and Trade Office in Indonesia". Bilateral relations have been closed in various fields. At the end of 2015, it opened a representative office in Surabaya with the name "Taipei Economic and Trade Office in Surabaya" [2].

There has been a positive result toward education and cultural relations by scholarship and Indonesian student in Taiwan. For instance, the Ministry of Education Republic of China (Taiwan) provides "Taiwan Scholarship" for an excellent international student to study in Taiwan to get a degree (bachelor, master or PhD). Other than that, each year also provides "Mandarin Scholarships" for Indonesian students to learn Mandarin in Taiwan. Each year the Taiwan government provides "Taiwan Scholarship" and "Mandarin Scholarships" for around 50 Indonesian students. Since 2004 until today, there are about 200 Indonesian students who have received the scholarship and study in Taiwan. In addition, universities in Taiwan provide free education, free accommodation and a variety of scholarships to increase internationalization and attract more international students to study in Taiwan. As regarding Indonesian student in Taiwan, currently, the numbers of Indonesian students studying in Taiwan are 6,811 students, including 4,000 students of Bachelor, Master and Doctoral degree, 317 exchange students and 1,626 students studying Mandarin. (ROC Embassies and Missions Abroad, 2019). As a matter of the face, Indonesia ranks third as the number of foreign students studying in Taiwan, after Malaysia and Japan. Indonesian students in Taiwan founded the "Indonesian Students Association in Taiwan" in May 2010. Their website is www.ppitaiwan.org [2].

Furthermore, according to Taiwan's Ministry of Education statistics, between the period of 2000-2016, Taiwan and Indonesia have signed 256 memorandums of agreement on education cooperation inter-university, which shows the increasing exchange of educational cooperation between the two sides. In 2011, the two sides signed "MoU on higher education cooperation."

In recent years, an increasing number of Indonesia students are turning their interest to study in Taiwan. However, Chinese education in Indonesia is fundamentally based on studies of Mainland China, therefore lacking opportunities for students to understand profoundly Taiwan's language and culture. Furthermore, there is a lack of opportunities for students to understand game design education and industry in Taiwan.

## II. Aim and Objectives

The purpose of this on-going program (2014-recent) is to enhance the understanding of game and animation design education in Taiwan, through international exchanges with students in Indonesia. It aims to promote exchanges between the faculty and students at the universities in Taiwan with faculties, lecturers and artists in Taiwan for collaborative work, especially in game art design, game engine and animation. It sincerely hopes that students could understand profoundly Taiwan's language and culture by game and animation online tutorial and provide opportunities for students to understand design power and market trend in Taiwan, Indonesia, and worldwide market. In order to fulfill this goal, it emphasizes in promoting the following five points and the Design Thinking Approach for Computational Creativity

1. Aside from the classes, universities from Taiwan and Indonesia has been organizing an International Workshop of Creative Computing in Game and Animation, so-called IWCCGA, in Tokyo, since 2014. The reason why select Tokyo as host place is because students love Tokyo and the city has very good animation and comics culture, as well as to attend Tokyo Game Show (TGS) and industrial visits. As regards, teachers from universities in Taiwan and BINUS established an organizing committee and invite students from Taiwan and Indonesia to attend the workshop. In Tokyo, Professor Akira Baba from National Tokyo University has been the local chair in 2014, and teachers from university in Taiwan and BINUS have been co-hosting this program since then. Since 2014, Dr Tin-Kai Chen from Shu-Te University has been the general chair and co-working with Game Application and Technology Program, Computer Science Department, School of Computer Science, Bina Nusantara (BINUS) University, Indonesia. We sincerely hope that students could share interdisciplinary research activities. The themes include but not subjects to game design, animation and special effects, media design, virtual reality (VR) and immersive technologies of human-computer interaction. The workshop, which was free in the registration fee, was followed by a day-long symposium hosted at selected university in Tokyo.
2. Based on Design Approach of Computational Creativity, we hold on-line tutorials in summer for free, including game art design, game engine, and presentation and English languages skills.
3. Provide support for students using social media, such as Google classroom, Line and Facebook. In particular, helping students to solve their problem in real-time, and translate their work into English.
4. Gather Taiwan-related publications and digital material for research and study.

## III. Literature Review

### A. What is the Design Thinking?

Questions:

- What can be regarded as a novel?

- What does it mean by useful?
- What means surprise?

Definition of Creative Computing (CC), by Prof. Hongji Yang, Leicester University, U.K. (Keynote in IEEE ISCC 2016)

- A creation has three characteristics: novelty, usefulness and surprising.

Design Thinking of Computational Creativity (CC2), by Dr Tin-Kai Chen (Lecture, 2010~recent)

- From a developer's point of view, it is a game design philosophy to gain competitive advantages by taking advantage of conventional digital tools, and at the same time revealing and solving existing problems.
- From a customer's point of view, it is a rich experience to gain a better quality-of-use and exciting game-play experience.
- From stockholder's point of view, as far as making a profit and expanding the game's product life are concerned, it is an innovative design approach.
- From teacher and students' point of view, it is about asking the right question to right person at right time. To design is about creative, and it is about learning-by-doing, and trial-and-error.

*B. On-Line Tutorial*

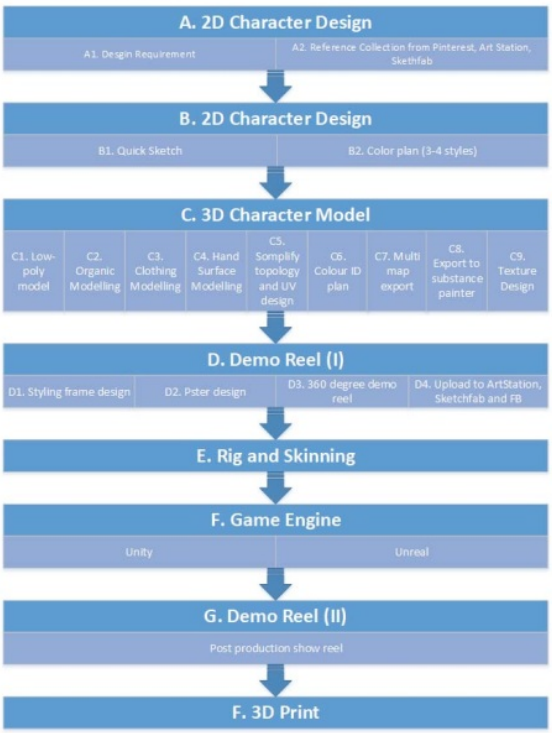


Fig. 2. Online Tutorial Structure of Game Character Concept, 3D Modeling and Demo.

Nowadays, the speed of knowledge-transfer and updating by online tutorial and digital media development have far exceeded the speed of taking the courses at school and tutoring in the classroom. This is an era of self-study and a competitive era of international competition.

In this program, the online tutorial was a six-week online workshop for students who want to learn more about using the Design Thinking, Digital Sculpturing and Game Design using digital tools such as Zbrush and Game Engine (i.e. Unity and Unreal), supporting both computational thinking and design thinking in the virtual classroom. The on-line tutorial was followed by a day-long symposium hosted at a selected local university in Tokyo. For more information about the program, please visit the official website: https://www.facebook.com/groups/IWCCGA/

*C. Industrial Workflow of Game Concept*

As the course structure, it is based on industrial workflow to design and demonstrate game art concept. As shown in Figure 2, it refers to the industrial workshop for a game character concept, 3D Modeling and demo. By taking each part of the on-line tutorial, it required that students need to submit four game characters and a final project. During this on-line tutorial, the lecturer continually guided students to design a complete game character creation based on industrial workflow, including storytelling, 2D concept (see Figure 3), 3D high-resolution model, and low-resolution model (See Figure 4), texture design. In addition, for more advanced skills such as unwrap UV, re-topology, rigging and skinning, and using the game engine for rendering and testing; those skills are included in different courses and by providing other resources.


Fig. 3. 2D Speech Painting - Orc Samurai and Axe (Designer: MasterKenKen)

Fig. 4. 3D Game Asset - Orc Samurai and Axe (Designer: MasterKenKen) (Source: https://skfb.ly/6ARJJ )

## VI. CASE STUDY

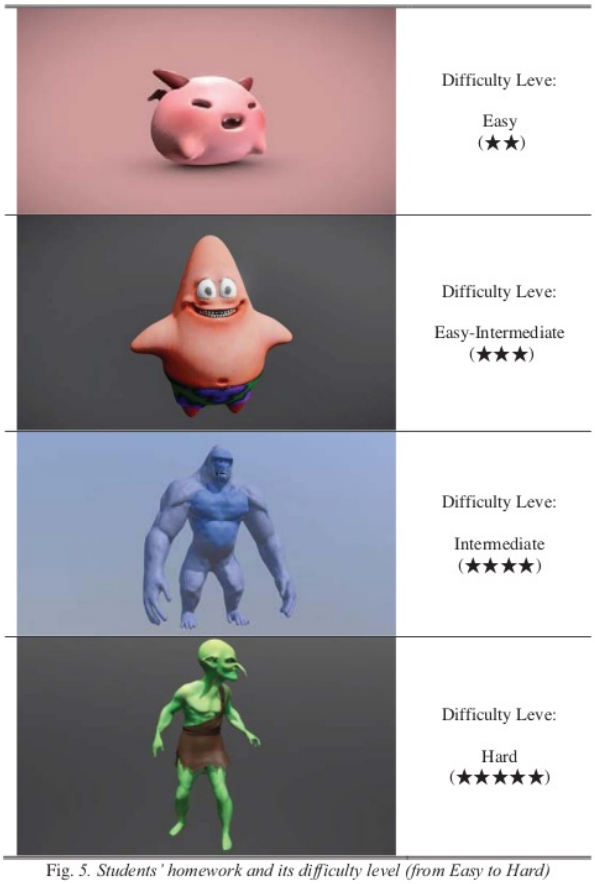


Fig. 5. *Students' homework and its difficulty level (from Easy to Hard)*

After five years of implementing the four points and the design thinking mentioned earlier, we have already observed some evident outcome. The biggest achievement comes from IWCCGA committee which has received significant responses and an increasing number of attendees from both Taiwan and Indonesia. As for BINUS, there have been 45 students enrolled in this program every year since 2014. In Taiwan, few students from Taiwan enrolled this program in 2014, and it increased to 16 people in 2018. In 2019, up to 21 students in Taiwan. Furthermore, the program in which not only students majoring in game and animation design but also a number of students majoring other department and universities have enrolled. Thus, the fact that an increase in the number of students enrolls to this program shows great curiosity to the program.

For instance, in 2018, in realizing its commitment to be part of the global community, BINUS UNIVERSITY through Game Application and Technology, School of Computer Science sent its representatives to participate in the 2018 activities of the 4th International Workshop on Creative Computing in Games and Animation (IWCCGA) and Tokyo Game Show (TGS). One of the lecturers Game Application and Technology and 48 students participated in the activity. more proud of the lecturer sand, Yogi Udjaja, was one of the keynote speakers at the event, Yogi shared his experiences about his research in making a Japanese learning game [3, 4]. IWCCGA is a collaborative activity coordinated by Game Application and Technology BINUS University, Tokyo School of Anime and universities in Taiwan, which for this time was held at Tsukuba University TGS is the largest gathering of game developers in the world. Yogi together with 48 BINUS University students also visited industry in Japan. Students who took part consisted of majors in Game Application and Technology, Mobile Application and Technology, Computer Science, Cyber Security, Visual Communication Design - Animation, Management, Information Systems. In addition, in this activity also held a meeting with BINUS alumni working in Japan. (News Letter from BINUS: http://binus.ac.id)

## V. STUDENTS' OUTCOME

We provided a few students' outcomes to demonstrate their design thinking logic and the final project. Through the program, we hope to bridge Taiwan-Indonesia relation. First, there would be four character design projects and one-line teaching material in the Google Classroom. As can be seen in Figure 5, from easy to difficult, students need to complete four characters, they are Devil Slim, Patrick Star, Orangutan and Goblin. The time taken for design each module is about 2 weeks to complete, i.e. six hours a week at home. Finally, each student produced a final project (See Figure 6, 7, 8 and 9)

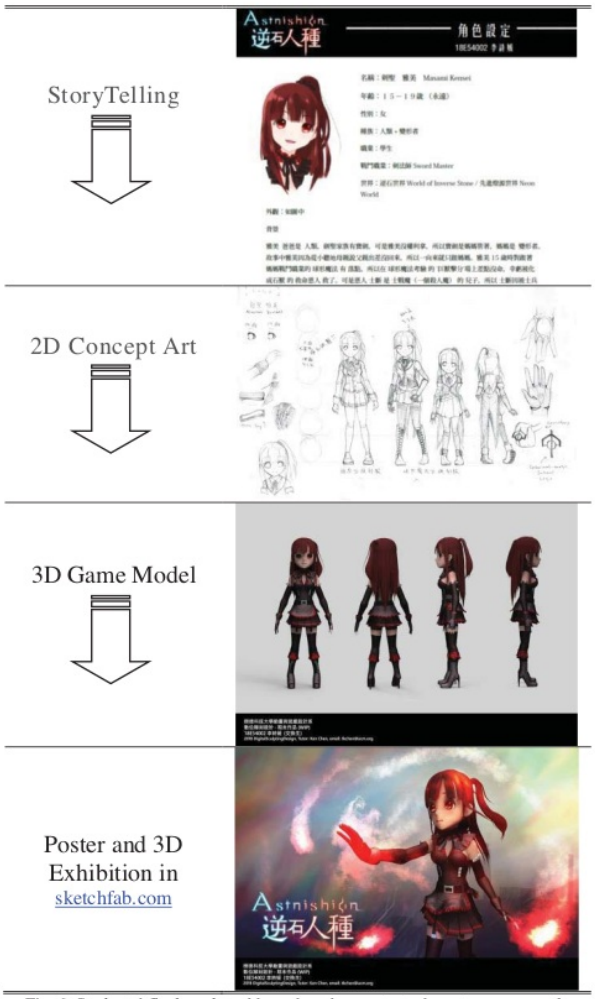


Fig. 6. Students' final work and how they demonstrate the outcome properly (Student: Amy Lee Sze Hwei, Bachelor of Arts (Honours) Digital Animation Student from Universiti Tunku Abdul Rahman, Malaysia.) (Tutor: Dr Tin-Kai Chen)

Fig. 7. Original Character Design with Chinese Culture (Student: Zhang Jie Ting, 2nd-Year Undergraduate Student, Department of Animation and Game Design, Shu-Te University) (Tutor: Dr Tin-Kai Chen)

Fig. 8. Original Character Design - Hu Sanniang (Student: Ms Mi-Hao HUANG, 2nd-Year Undergraduate Student, Department of Informatics, Shu-Te University) (Tutor: Dr Tin-Kai Chen)

Fig. 9. Original Character Design–Water Margin 2 (Student: Ms. Tsz-Yung, 2nd-Year Undergraduate Student, Department of Animation and Game Design, Shu-Te University) (Tutor: Dr Tin-Kai Chen)

## IV. Discussion and Future Works

This on-going program proved to great success in promoting international exchanges with Taiwan in game and animation education. It provided a good exposure of game and animation design not only to students but also to a general audience from different departments in universes around Taiwan and Indonesia. Since the language used in the program is English, the audience in the English-speaking world has a good window to learn and understand the Taiwanese culture. However, the language is always the barrier for international exchange event, the committee would consider providing static poster exhibition for those students having weakness in English speaking and listening ability in the future.

In addition, the deans of faculty and heads of departments from universities in Taiwan and Indonesia, found that the program was very cooperative and accommodative in scheduling of the lecture events and become one of key performance indicators (KPI) to demonstrate the university's commitment to international exchange, requested by Ministry of

Education (MOE), Taiwan. It is looking forward to continuing the program in the future.

Since the program launched in Sept 2014, there had not been sufficient funding to provide demonstrable impact for many of the longer-term activities. In 2018, we were happy to report that the Ministry of Education (MOE), Taiwan has provided patricianly financial supports to those students who had been selected for the program. By co-hosting the workshop for over five years, both universities in Taiwan and Indonesia are making good progress toward the potential of the following:

- Student exchange programme;
- Lecturer exchange programme;
- Guest Lecturer;
- Research collaboration including but not limited to research activities, co-hosting conferences, research projects. For instance, the implementation of Facial Expression Recognition for a dynamic balancing system to enhance the player's experiences in the game [5,6,7].

On this point, we hope to see the followings:

- Increase in the number of students taking this program;
- Increase in the number of students taking Mandarin language;
- Increase in the number of Indonesia students studying in Taiwan;
- Increase in the number of community citizens that are aware of and interested in knowing more about Taiwan; and
- Increase in the number of Taiwan scholars and students that visit/attend/lecture at the Universities in Taiwan.

In addition, we had received job and internship opportunities from game industries in Taiwan and Indonesia for those attendances. However, there is a lack of students' language ability. In Taiwan, most of the attendances could not speak English fluently, and few attendances from Indonesia could speak Taiwan's language. In the near future, it hopes that we can hold a public event such as lecture, workshop and exhibition to raise awareness of and develop an affinity with Taiwanese language and culture among the general public using the game and animation, such as Taiwan language on-line course or game-based learning.

## ACKNOWLEDGEMENT

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